Climate Change Beliefs, Concerns and Attitudes toward Adaptation and Mitigation among Corn Belt Producers

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Survey of Farmer Perspectives on Climate Change

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• Cropping Systems Coordinated Agricultural Project: Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems (CSCAP)

• Useful to Useable (U2U)

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Purpose of Survey

• Adjustment to potential natural hazards depends on perceptions of risks, which are mediated by beliefs about (1) the existence of the hazard and (2) its characteristics.

• If producers do not believe that climate change is happening or do not perceive it as a threat, they will not be likely to undertake adaptive or mitigative actions.

• We need to understand where producers stand in order to develop effective outreach strategies.
Survey Information:
• Survey conducted by NASS (National Agricultural Statistics Service)
• Survey utilized 22 HUC6 watersheds, representing roughly 60% of U.S. corn production
• Focus on larger-scale producers: $100K+ Gross Revenue and a minimum of 80 acres of corn production
Survey Response

• Survey sent to 18,707 eligible producers

• 4,778 producers responded (26% response rate)

• Numerous agricultural census variables were compared between respondents and non-respondents and no differences were found – meaning the census was representative of the general agricultural population.

• Minnesota River Watershed (07200) response total was 237 which is 5% of all respondents and the watershed had a response rate of 26.5%.
Is Climate Change occurring?

- **Corn Belt**
  - CC occurring, mostly human causes: 8.0%
  - CC occurring, equally natural and human causes: 33.0%
  - CC occurring, mostly natural causes: 24.5%
  - Insufficient evidence: 31.0%
  - CC not occurring: 3.5%

- **MN 70200**
  - CC occurring, mostly human causes: 7.5%
  - CC occurring, equally natural and human causes: 37.2%
  - CC occurring, mostly natural causes: 24.8%
  - Insufficient evidence: 28.8%
  - CC not occurring: 1.8%
Perceived Risks

Questions were based on predicted impacts of climate change on Corn Belt Agriculture.

“How concerned are you about the following potential problems for your farm operation?”

• Drought and heat
• Excess water issues
• Pest and disease issues
Concerns at my farm operation

(Agree or Strongly Agree)

- Longer dry periods and drought: 59% (All farmers), 59% (MN 70200)
- Increased heat stress on crops: 52% (All farmers), 46% (MN 70200)
- More frequent extreme rains: 50% (All farmers), 46% (MN 70200)
- Higher incidence of crop disease: 50% (All farmers), 50% (MN 70200)
- Increased weed pressure: 49% (All farmers), 45% (MN 70200)
- Increased loss of nutrients into waterways: 33% (All farmers), 30% (MN 70200)
- Increased soil erosion: 38% (All farmers), 25% (MN 70200)
Top producer concerns

• Drought was the most prevalent concern, with heat, pests and disease, and excess water following close behind.

• Clear pattern of relationship with climate change belief: Producers who believe that Climate Change is happening and that humans are contributing to this, are more concerned and likely to take adaptive or mitigative actions.
Concerns at my farm operation

All Producers – by belief

- More frequent extreme rains:
  - 49% believe CC occurring, mostly human causes
  - 47% believe CC occurring, equally natural and human causes
  - 43% believe insufficient evidence
  - 24% believe CC not occurring

- Increases in saturated soils/ponding:
  - 50% believe CC occurring, mostly natural causes
  - 39% believe CC occurring, equally natural and human causes
  - 36% believe CC occurring, mostly human causes
  - 26% believe insufficient evidence
  - 26% believe CC not occurring
Attitudes towards adaptation and mitigation

What should be done and by whom?

Question - “Organizations, agencies, and individuals can do a number of things to prepare for or address potential changes in climate. Please provide your opinions on the following statements.”

Focus on preparing for “increased weather variability”

- Producers
- Farm groups
- Government agencies
- Extension
- Seed companies
- Develop alternative markets
Adaption – Leadership

(Agree or Strongly Agree)

- **Seed companies should develop crop varieties**: Corn Belt 84%, MN 70200 86%
- **Farmers should take additional steps to protect farmland**: Corn Belt 66%, MN 70200 67%
- **University Extension should help farmers to prepare**: Corn Belt 63%, MN 70200 61%
- **Farm orgs (e.g., Corn Growers) should help farmers to prepare**: Corn Belt 52%, MN 70200 48%
- **State and federal agencies should help farmers to prepare**: Corn Belt 43%, MN 70200 43%
Alternative Markets

- **Profitable markets for small grains and other alternative crops should be developed to encourage diversified crop rotations**: 63% (Corn Belt) vs. 70% (MN 70200)
- **Profitable markets for biomass should be developed to encourage planting of perennial crops (grasses, trees) on vulnerable land**: 50% (Corn Belt) vs. 46% (MN 70200)
- **Profitable markets for carbon credits should be developed to encourage use of conservation tillage, cover crops, and other practices**: 38% (Corn Belt) vs. 31% (MN 70200)
Influence of Organizations and Peers

• Many factors influence producers decision making

• Asked “Please indicate how influential the following groups and individuals are when you make decisions about agricultural practices and strategies.” Scaled answers from “no influence” to “strong influence”.

• NRCS, FSA, Extension, Ag chemical dealers, farm organizations, other farmers, etc.
Moderate to Strong Influence

- Chem Dealers: 72% Corn Belt, 72% MN 70200
- Other Farmers: 51% Corn Belt, 52% MN 70200
- Crop Advisers: 47% Corn Belt, 47% MN 70200
- NRCS: 41% Corn Belt, 35% MN 70200
- FSA: 31% Corn Belt, 30% MN 70200
- Extension: 24% Corn Belt, 19% MN 70200
- Farm Orgs: 19% Corn Belt, 19% MN 70200
• Many producers are concerned about possible climate change related threats to Corn Belt agriculture
• Perception of risk varies greatly and generally associated with producer beliefs
• Many support individual level adaptation: Producers have solid track-record of adaptation
• Most producers do not believe that climate change is caused by human activities
• Mitigation through GHG reduction is unpopular, adaptation is preferred approach to CC effects
• NRCS and Extension have some influence among producers and those producers tend to be more open to action to adapt to increasing weather variability.
• Those producers, in turn, may exert influence over some of their peers
In your own words: What makes a "good" farmer?

- Minimizes soil erosion: 86%
- Maintains or increases soil organic matter: 82%
- Minimizes nutrient runoff into waterways: 80%
- Manages for both profitability and minimization of environmental impact: 79%
- Is willing to try new practices and approaches: 60%
Experienced over the last five years

Have had problems with saturated soils or ponding: 83%
Have creeks, streams or rivers run through or along farmed land: 57%
Experienced significant drought: 36%
Experienced significant flooding along stream or river along farmed land: 31%
BMPs used on land owned (MN 07200 only)

- Nutrient management: 85%
- Precision agriculture: 58%
- Grassed waterways: 50%
- Reduced tillage: 38%
- Cover crops: 15%
- Controlled drainage structures: 6%
Influence on farm decisions  (MN 07200 only)

- **1 to 7 day forecast**: 85%
- **Current weather conditions**: 82%
- **8 to 14 day outlook**: 67%
- **Monthly or seasonal outlooks**: 40%
- **Historical weather trends**: 32%
Other CSCAP Resources

• Website – Useful to Useable (U2U) – Decision Dashboard
• Website – www.sustainablecorn.org
• Copies of Statistical Atlas
• Many peer-reviewed publications available
• Special Issue of the Journal of Soil and Water Conservation – Nov/Dec 2014, Vol 69, #6
• Issue of Agricultural and Human Values (Wilke & Morton)
Climatologists’ patterns of conveying climate science to agricultural community

(Wilke & Morton)

• Using language to connect and not alienate

• Using “increasing weather variability” rather than “climate change”

• Using the term “climate change” can elicit the same response as “I’m with the government and I’m here to help”
Current communication style is the “deficit model”

- Assumption that the audience simply lacks knowledge and/or information on an issue and if those deficits are filled, understanding and behavior change will follow

- This has not been proven to be effective

- Move beyond this obstacle by linking the facts and information to alternative courses of action and the values of the decision maker

- Integrate scientific results into management decisions
Understanding Corn Belt farmer perspectives on climate change to inform engagement strategies for adaptation and mitigation

• Recognize that understanding is strongly influenced by context and culture in formation of beliefs

• Key to improved communication between those with differing beliefs, knowledge and skills is to find a shared interest in finding solutions

• Producers that have experienced effects or perceive a threat from increasing weather variability are more interested and receptive to finding solutions
CSCAP Survey Classifications

• Producers fell into 1 of 6 classes

  – Classes 1 to 3 (63%) are responsive to adaptation and mitigation, they have often reported impacts already from climate change

  – Classes 4 to 6 (37%) don’t believe in climate change, are less concerned with the risks and more confident in their ability to adapt (if needed)

• Roughly half (18%) of this group reported little or no experience with adverse weather over the last five years, while the other half has experienced adverse weather but have supreme confidence that they can adapt to it

Arbuckle, J., et al
CSCAP Survey Findings

• All six classes of producers were most similar in their confidence that they can use their knowledge, skills and available tools to adapt.

• Recommended engagement strategies include appealing to producers’ problem solving ability and feelings of efficacy (confidence to create beneficial changes).

• Producer belief in CC is often influenced by first-hand experience. The greater the perceived risk, the greater the willingness to modify behavior.

• Target audience – producers that have experienced climate change effects first hand or perceive “increasing weather variability” as a threat to their operation.

Arbuckle, J., et al
RCRCA links to CSCAP resources
Decision Dashboard

U2U DST Suite | Other Decision Resources | Agro-Climate Reports | Weather/Climate Maps | Drought Info | Climate Outlooks | Helpful Links

U2U DST SUITE

AgClimate View DST

A convenient way to access customized historical climate and crop yield data for the U.S. Corn Belt. View graphs of monthly temperature and precipitation, plot corn and soybean yield trends, and compare climate and yields over the past 30 years.

Corn GDD DST

Track real-time and historical GDD accumulations, assess spring and fall frost risk, and guide decisions related to planting, harvest, and seed selection. This innovative tool integrates corn development stages with weather and climate data for location-specific decision support tailored specifically to agricultural production.

Probable Fieldwork Days DST

This spreadsheet-based tool uses USDA data on Days Suitable for Fieldwork to determine the probability of completing in-field activities during a user-specified time period. This product is currently available for Illinois, Iowa, Kansas, and Missouri. (Hosted by the University of Missouri)
OTHER DECISION SUPPORT RESOURCES

Corn Nitrogen Rate Calculator
(Selected Corn Belt States)
Hosted by Iowa State University and based on the latest nitrogen (N) rate research data in the Corn Belt, this tool helps farmers determine profitable N rates based on user-defined location, rotation patterns, and corn and N prices.

Nitrogen Watch
(Midwest)
This tool from the University of Missouri tracks rainfall and identifies danger areas that are on track to have widespread problems with N loss and deficiency in corn. Maps are updated from about late April thru early July, and archives go back to 2009.

Enviro-Weather
(Michigan)
Michigan State University’s weather-based decision-making resource for pest, production and resource managers.

Missouri Crop Progress Maps
(Missouri)
This tool from the University of Missouri Commercial Agriculture Extension Program provides state and district-level crop progress data from 1977-2010 along with average frost/freeze information. Grouped by decade, these summarized graphs show the average timing of planting, silking, and harvest for corn, soybean, and wheat crops.

Irrigation Scheduling & Crop Water Use
Irris Scheduler
(Indiana)
KanSched2
(Kansas)
Irrigation Scheduler
(Michigan)
Crop Water Use Calculator
(Michigan)
Soy Irrigation Tool
(Missouri)

Pileus Project: Climate Science for Decision Makers
(Michigan)

Agriculture Tools
Focused on the tart cherry industry, these tools help growers assess how past and future climate trends affect tart cherry production.

Climate Tools
Access charts and graphs of historical weather data and learn about future climate scenarios with audio-visual learning modules.

Cover Crop Decision Tool
(Selected Corn Belt States)
This tool from the Midwest Cover Crop Council assists farmers in selecting cover crops to include in row crop production. Cover crops help reduce soil erosion and increase nutrient recycling on farmlands, which in turn lowers soil and nutrient loads entering lakes and rivers.

Thermal Models
(Wisconsin and Minnesota)
The University of Wisconsin Extension Ag Weather provides several temperature-based models that can be used to predict crop development and pest emergence. Models specific to corn development and corn pests are available.
2014 Crop Market Outlook

The 2014 Crop Market Outlook is authored by Chad Hart, Assistant professor for Grain Markets Specialist at Iowa State University. The outlook provides current corn and soybean supply/demand information from USDA, and highlights major factors influencing the feed, export, and ethanol markets. It also provides a snapshot of market prices and potential production concerns for the current growing season.

Weekly Weather & Crop Bulletin

The Weekly Weather and Crop Bulletin (WWCB) is jointly prepared by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and the U.S. Department of Agriculture. It provides information on weather, climate and agricultural developments worldwide, along with detailed charts and tables of agro-meteorological information that are appropriate for the season.

U.S. CLIMATE OUTLOOKS

Temperature
- 8-14 Day Outlook
- 1 Month Outlook
- 3 Month Outlook

Precipitation
- 8-14 Day Outlook
- 1 Month Outlook
- 3 Month Outlook

Climate Summaries and News

Some State and Regional Climate Offices provide narrative summaries of recent weather and climate conditions and events. These are typically updated on a monthly basis, although some offices provide more frequent updates.

High Plains
- Missouri

Illinois
- North Dakota

Indiana
- South Dakota

Iowa
- Wisconsin

Minnesota

USDA-NASS Weekly Crop Progress & Condition Reports

Weekly Crop Progress & Condition Reports includes information about degree days, temperature, precipitation, crop planting progress, crop development and harvesting progress. Reports are issued weekly (April – Nov) by USDA-NASS state offices.

Illinois
- Missouri

Indiana
- Nebraska

Iowa
- North Dakota

Kansas
- Ohio

Michigan
- South Dakota

Minnesota
- Wisconsin

University Extension Newsletters/Information

University Extension newsletters and websites provide practical advice and information about agricultural production, pest management, marketing, and more.

Ag Decision Maker (Iowa State)
- Field Crops News (Michigan State)

AgManager (Kansas State)
- ICM News (Iowa State)

Chat n Chew Cafe (Purdue)
- Pest & Crop (Purdue)

C.O.R.N. Newsletter (Ohio State)
- The Bulletin (Illinois)

Crop Manager (Wisconsin)
- Weekly Outlook (Illinois)

Crop Watch (Nebraska)
- FarmDoc (Illinois)
Thank you!

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